DOCUMENT RESUME

ED 281 109 CG 019 843

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TITLE Environmental Cues in Children's Creative Thinking.
PUB DATE 26 Apr 87
NOTE 15p.; Paper presented at the Annual Meeting of the Western Psychological Association (67th, Long Beach, CA, April 23-26, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adolescents; Classroom Environment; Creative Thinking; *Creativity; *Cues; *Divergent Thinking; Elementary Education; *Environmental Influences; *Preadolescents; Predictive Validity; *Testing Problems

ABSTRACT

Divergent thinking tests are probably the most commonly used measure of children's creative thinking. A study was conducted to examine the influence of environmental cues on the divergent thinking of children between the ages of 11 and 13. All subjects received the Uses, Instances, and Line-Meanings divergent thinking tests. Each test involved three questions for a total of nine divergent thinking tasks administered to the subjects in their classrooms. Three tests were administered and used as criteria for analyses of predictive validity: How Do You Think test, Teachers' Evaluation of Students' Creativity, and Creative Activities Check List. The results revealed that only two of the nine tasks had a significant proportion of ideas that were related to the immediate environment. One of these was from the Instances test, and the other was from Line-Meanings. A multivariate analysis of variance indicated that the proportion of original ideas increased significantly when the environmentally cued ideas were controlled. Further, scores which were adjusted for environmental cues had slightly higher predictive validity than unadjusted scores. Still, the difference between the predictive validity coefficients was unimpressive. Taken together, the results suggest that the testing environment has only a small influence on the divergent thinking of intermediate school children. (Author/NB)

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ED281109

Environmental Cues in Children's Creative Thinking

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Abstract

This investigation examined the influence of environmental cues on the divergent thinking of intermediate school children. Nine divergent thinking tasks were administered to 120 children in their classrooms. Surprisingly, but only two of the nine had a significant proportion of ideas that were related to the immediate environment. One of these was from the Instances test, and the other was from Line-Meanings. A MANOVA indicated that the proportion of original ideas increased significantly when the environmentally cued ideas were controlled. Further, scores which were adjusted for environmental cues had slightly higher predictive validity than unadjusted scores. Still, the difference between the predictive validity coefficients was unimpressive. Taken together, the results suggest that the testing environment has only a small influence on the divergent thinking of intermediate school children.

Environmental Cues in Children's Creative Thinking

Divergent thinking tests are probably the most commonly used measure of children's creative thinking. They contain open-ended questions (e.g., "Name all of the things you can think of that are strong"), and an examinee is asked to generate a number of responses. Although these tests are theoretically related to creativity (Mednick, 1962; Wallach & Kogan, 1965) and have moderate empirical validity (Runco, 1986a, 1986b), one concern is that "environmental cues" may distort divergent thinking test results. Ward (1969), for example, demonstrated that when asked to "Name all of the things you can think of that are rectangular," many preschool children responded "door, window, book," and so on, giving primarily ideas that were suggested by the cues present in the immediate environment. Apparently, only talented examinees relied primarily on their ideational skills, and did not use the immediate environment for responses.

The influence of environmental cues is important to understand because a fundamental assumption of divergent thinking tests is that they index cognitive ability and are impervious to the testing environment. There is also a related question of test reliability, for the examinee who uses ideational skill is more likely than the examinee who relies on environmental cues to find unique and original ideas.

The present investigation is a within subject examination of the effects of environmental cues. Earlier research on this issue involved only preschool children, and examined only the frequency of environmentally imposed ideas. The objectives of the present investigation are to examine the frequency and validity of environmentally cued ideas in the divergent thinking of intermediate school children.

Method

The subjects (N = 120) were between 11 and 13 years old, and the range of IQs was 98 to 165. All children received the Uses, Instances, and Line-Meanings divergent thinking tests (Wallach & Kogan, 1965). Each test three questions (for a total of nine divergent thinking tasks), and each was administered in the examinees' classrooms (see Runco, Okuda, and Thurston, 1987).

After the data were collected, a lexicon containing every idea was compiled for each of the nine items. Three experienced teachers were then asked to rate each idea (on a zero-to-three scale) in terms of its relationship to the school environment. The instructions to the teachers are presented on the following page.

Three tests were administered and used as criteria for analyses of predictive validity. These were the How Do You Think test (Davis, 1975), the Teachers' Evaluation of Students' Creativity (Runco, 1984), and the Creative Activities Check List (Runco, 1986a) with quantity and quality of performance scores. IQs and CAT scores were obtained from students' records.

Instructions to the Teachers

The following lists contain children's responses to open-ended questions (e.g., "name all fo the things that you can think of that are strong"). We are interested in determining which ideas are imposed or directly suggested by the school environment. Your task is to rate the degree to which each idea reflects the school environment. Use this rating scale: 3 means found in all classrooms; 2 means found in many classrooms; 1 means found in few classrooms; and 0 means never in a classroom. Include the students as part of the classroom. Please consider each, take your time, and do not evaluate the quality of the ideas (i.e., if they are "good" or "bad" ideas).

Results

The teachers' ratings were reliable, with interrater agreement averaging 70%. Ideas which were given high ratings by the teachers were eliminated from the ideational pool. An examination of the frequency of environmentally cued ideas revealed that only two of the nine ideas had a notable proportion of environmentally related ideas. These were "square things" from the Instances test, with 29.7% of the ideas related to the environment, and one of the Line-Meanings items, with 22.0%. The remaining seven of the divergent thinking items had very few responses that were suggested by the classroom environment, with a median of 12%.

Fluency and originality scores (Runco & Albert, 1985) were calculated for the two items that had notable proportions of environmentally cued ideas, with scores before (unadjusted) and after (adjusted) eliminating environmentally cued ideas. The means and standard deviations are given in Table 1.

Before versus After Adjustment

A multivariate analysis of variance (MANOVA) was used to confirm that the adjusted and unadjusted scores were significantly different. The first analysis included difference scores (unadjusted minus adjusted) for the four divergent thinking indices (fluency and originality from each test). Sex and grade were included as between subject factors. Results

indicated that there was a significant difference between the unadjusted and adjusted scores in the multivariate test (Rc = .81, F (4, 100) = 46.38, $p < .001$) and each of the univariate tests (15.35 < Fs < 119.11, all $p < .01$). The interaction between grade and the adjustment was significant (Rc = .30, F (4, 100) = 2.52, $p < .05$), with the eighth-graders having a larger difference between unadjusted and adjusted scores than the seventh-graders. The interaction with gender and the three-way interaction were not significant.

A second MANOVA was conducted using summation scores (unadjusted plus adjusted). The main effect for grade was significant (Rc = .44, F (4, 100) = 5.83, $p < .001$), with eighth-graders having higher scores than seventh-graders. Gender and the two way interaction were not significant.

The differences between the adjusted and unadjusted scores were also confirmed with t-tests for dependent samples, with significant differences for Instances fluency (t (112) = 10.05, $p < .001$), Instances originality (t (112) = 10.74, $p < .001$), Line-Meanings fluency (t (119) = 4.11, $p < .001$) and Line-Meanings originality (t (119) = 4.33, $p < .001$).

Originality Scores

One of the most important questions is whether or not the proportion of original ideas increases in the adjusted scores. To test this, a originality:fluency ratio was calculated for the unadjusted and adjusted scores of each test. These ratios were

compared with t-tests (one-tailed) for dependent samples. Results indicated that the proportion of original ideas was significantly higher in the adjusted scores for Instances (t (119) = 1.90, $p < .05$) and Line-Meanings (t (119) = 4.58, $p < .001$). The means and standard deviations for the ratios were as follows: Instances unadjusted (.264, .29) and adjusted (.293, .35); Line-Meanings unadjusted (.199, .14) and adjusted (.153, .18).

Validity

The validity of the adjusted and unadjusted scores was examined with correlational analyses. A canonical correlation indicated that the adjusted ratios were significantly related to the four criteria of creativity ($Rc = .37$, $p < .05$). The unadjusted ratios were unrelated to the same criteria ($Rc = .33$). Canonical analyses also indicated that both sets of ratios were unrelated to IQ and CAT scores. The matrix of product-moment correlations is presented in Table 2. Note that all coefficient reported here may be attenuated due to the unreliability of the tests or the range of scores.

Discussion

These results suggest that the classroom environment does not significantly influence the divergent thinking test performance of seventh- and eigth-grade children. Only two of nine divergent thinking test items had a significant number of ideas that were related to the classroom. Further, when the environmentally cued

ideas were controlled, the adjusted scores were only slighly more valid than the unadjusted scores. Only the increased proportion of original ideas is consistent with the view that divergent thinking is influenced by environmental cues.

A componential view of divergent thinking (Runco & Okuda, 1987) might suggest that using environmental cues is a legitimate strategy to use when faced with an open-ended task. Perhaps creative individuals are open to environmental cues as starting point for their thinking. The cues may initiate a series of associations that will lead to a truly creative idea that is only very remotely related to the environment. Mednick's (1962) associative theory is pertinent here; but the point is that environmental cues may be used by creative examinees. The use of these cues may be an important metacognitive component of divergent thinking.

The present results are incongruent with Ward's (1969) findings about environmental cues. However, in the present study, the ideas identified by the teachers were potentially but not definitely cued by the environment. The ideas chosen as related to the classroom may in fact have been given by the children without their using environmental cues. Further research should be conducted to examine the influence of the environment. Other testing environments and divergent thinking tasks could be examined. Additionally, interitem patterns should be considered. When responding to the question, "Name all of

the things you can think of that are round," the second response (e.g., "Mars") may be dependent upon the first reponse (e.g., "Saturn"). Using interitem connections is another potential metacognitive strategy. For now, it appears that environmental cues play only a small part in the divergent thinking process, and that divergent thinking tests are no more valid when environmentally cued ideas are taken into account.

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Table 1

Means and Standard Deviations for Instances and Line Meanings

	Instances				Line-Meanings			
	Before		After		Before		After	
	M	SD	M	SD	M	SD	M	SD
Scores								
Fluency	16.2	16.1	8.5	9.9	3.8	2.7	2.7	2.2
Originality	2.7	4.7	2.0	3.4	1.3	1.9	1.1	1.6

Table 2

Predictive and Discriminant Validity Coefficients

	Criteria					
	HDYT	Teach. Eval.	Activity Quantity	Activity Quality	IQ	CAT
Unadjusted						
Fluency						
Instances	06	06	24	-03	12	15
Lines	23	07	09	-17	14	18
Originality						
Instances	12	13	24	06	11	17
Originality	22	13	04	07	10	29
Adjusted						
Fluency						
Instances	03	06	18	-09	17	23
Lines	20	06	07	-11	15	19
Originality						
Instances	11	19	24	05	12	26
Originality	19	13	03	05	16	27

Note. How Do You Think test (HDYT; Davis, 1975); Teachers' Evaluation of Students' Creativity (Runco, 1984); Creative Activity Quantity and Quality (Runco, 1986); IQ; and California Achievement Tests composite.